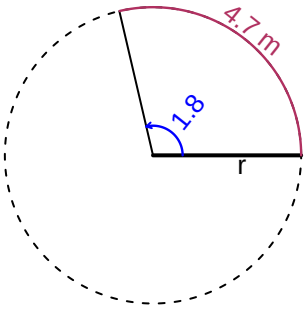
Name: Date:

Trig Final (Solution v23)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 4.7 meters. The angle measure is 1.8 radians. How long is the radius in meters?

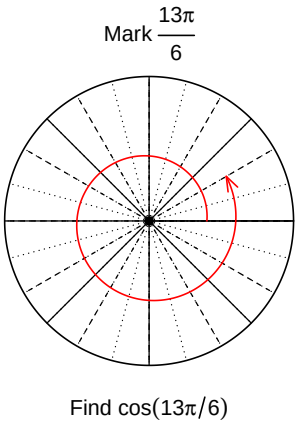


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

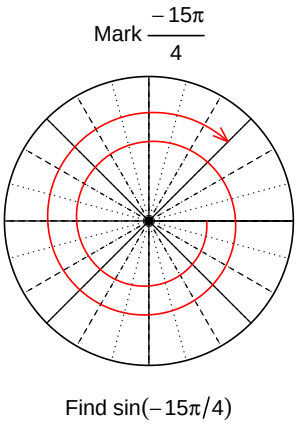
$r = 2.611$ meters.

Question 2

Consider angles $\frac{13\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{6}\right)$ and $\sin\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(13\pi/6)$



Find $\sin(-15\pi/4)$

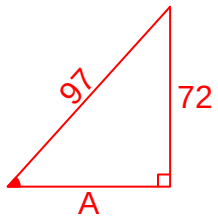
$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-72}{97}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

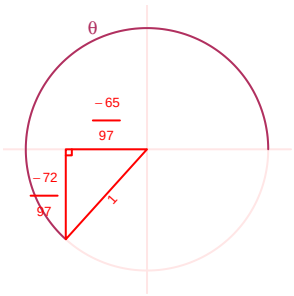
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.76 Hz, an amplitude of 2.09 meters, and a midline at $y = -3.77$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.09\cos(2\pi 6.76t) - 3.77$$

or

$$y = 2.09\cos(13.52\pi t) - 3.77$$

or

$$y = 2.09\cos(42.47t) - 3.77$$